REMARKS

This is in response to the non-final Official Action currently outstanding with regard to the above-identified application.

Claims 1-11 were present in this application as of the time of the issuance of the currently outstanding Official Action. By the foregoing Amendment, Claims 1-4 and 7-10 have been amended. No claims have been added, and no claims have been canceled. Accordingly, upon entry of the foregoing Amendment, Claims 1-11 as set forth above will constitute the claims under active prosecution in this application.

The Claims as they will stand upon the entry to this Amendment are set forth above as required by the Rules.

More specifically, it is noted that in the currently outstanding FINAL Official Action, the Examiner has:

1. Acknowledged Applicants' claim for foreign priority under 35 USC 119(a)-(d) or (f), and indicated that the required certified copies of the priority document have been received by the United States Patent and Trademark Office;

2. Withdrawn his previous objection to the drawings under 37 CFR 1.83(a) thereby implying that the drawing as they presently stand are acceptable – **confirmation of the acceptability of the drawings as they presently stand in response to this communication is respectfully requested**;

3. Indicated that Applicants' Request for Continued Examination has been duly entered;

4. Noted that Applicants have left a clause that previously appeared in Claim 3 out of Claim 3 as filed with in the Amendment Accompanying this RCE and indicated that this omission is deemed to be intentional;

5. Indicated that Applicants' addition to the specification at page 17 is deemed to constitute "new matter" and required the deletion thereof;

6. Objected to Applicants' use of the word "effective" at lines 25 and 26 of Claim 1, and required the deletion of that word so as to make the wording of the claim consistent with lines 8 and 23 thereof;

7. Rejected Claims 1-11 under 35 USC 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to convey to one skilled in the relevant art that the inventors at the time that the application was filed had possession of the invention in that:

   (i) the use of the phase "effective resistance values" is not found in the disclosure as filed;

   (ii) without a definition of the ratios meant, the use of the phraseology "positive-side (high level) voltage resistance division ratios"; "negative-side (low level) voltage resistance division ratios" and "resistance division ratios of the resistance-type voltage division circuit are to conform to the target level shift characteristics and γ characteristics of the target gray scale levels"

   are not described in a manner enabling one skilled in the art to practice the invention without a definition of "resistance division ratios"; and

8. Rejected Claim 1-11 under 35 USC 103(a) as being unpatentable over the Kamei, et al reference in view of the Nitta, et al. reference (U.S. Patent 6,275,207 B1).

Further comment in these Remarks regarding items 1-3 above is not considered to be necessary in these Remarks.

With respect to items 4-6, Applicants by the foregoing Amendment now have deleted the word "effective" from the specification amendment at page 17 and from the claims. It had heretofore been Applicants' belief that the word "effective" in the context of this application would have been well understood by one skilled in the art in the context of this invention. Specifically, Applicants respectfully submit that it would have been abundantly clear to one skilled in the art that the resistance ratio at a particular junction of the resistance-type voltage division circuit would be a ratio of the "effective" resistance at the junction of interest.

In view of the Examiner's objection, Applicants now have deleted the word "effective" previously inserted for the foregoing reasons of clarification. In this respect, Applicants respectfully note that this action is being taken to advance the prosecution of this application. Applicants remain of the belief that their previous Amendment did not add any new matter to this application. This is particularly the case because the words of the claims do not have to be found exactly in the specification so long as a comparable teaching is disclosed therein. Such is believed to have been the case in this application.

Further, in view of the foregoing Amendment, Applicants have deemed it necessary to reinstate the portion of Claim 3 that the Examiner correctly noted was left out of Claim 3 as filed with the Amendment accompanying this RCE application.

Applicants respectfully **traverse** the Examiner's rejections under 35 USC 103(a) and 35 USC 112, first paragraph. In support of this traversal Applicants respectfully assert the following arguments.

The Examiner unequivocally indicates that the "source line driver" of this invention is different from the "source driver" described and claimed in the cited references. Therefore, it will be readily seen from Figs. 2 and 3 of the present application that the source line driver circuit 8 includes as distinct elements the source driver 2 and the grayscale ***reference*** voltage generation circuits 9. Further, it is to be noted that in the present invention the source driver 2 includes ***as an internal part thereof*** the gray scale voltage generation circuit (which is to be distinguished from the grayscale ***reference*** voltage generation circuits 9 mentioned above). See, present specification at page 7.

In characterizing the Kamei reference, the Examiner indicates at page 8 of the currently outstanding Official Action that that reference discloses "an active matrix liquid crystal display device comprising a plurality of pixels disposed in a matrix (col. 1, line 63), a plurality of data signal lines (drain signal lines, col.3, lines 38-39), a plurality of scanning signal lines (scanning lines, col.4, line 39), switching devices (TFT's, col. 1, lines 19-20) and ***a source line driver (fig. 1)***, which comprises a grayscale reference voltage generation circuit (a circuit including elements (4-8) and a ***source driver (a circuitry including a voltage dividing resistor circuit (col. 2, line 64), a buffer, and drain drivers (10, 11) including a plurality of output terminals*** ...". Applicants respectfully note, however, that nowhere in the Kamei reference are the circuit components disclosed separated into a "source line driver" (i.e., a source line drive circuit) and a "source driver" as disclosed in the present specification and herein claimed. Instead, in the only language comparable to that used in the present application, the Kamei reference refers to "drivers" (i.e., upper drain driver 10 and lower drain driver 11).

Accordingly, as shown in Fig. 1 of the Kamei reference, the gradation voltages therein generated by the upper voltage dividing resistor circuit are supplied to the upper drain driver 10, and the gradation voltages produced by the lower voltage dividing resistor circuit are supplied to the lower drain driver 11 (see the Kamei specification at col. 3, lines 32-37). In other words, despite the Examiner's attempt to distort the teachings of the Kamei reference by the attribution of labels to portions of the circuitry therein shown derived from the present specification (which circuit portions do not correspond to the clear intent of the Kamei disclosure), in the Kamei reference the gradation voltages are supplied to the upper and lower drivers 10 and 11 ***from the outside thereof***. Specifically, in Kamei et al., the voltage dividing resistor circuit is ***externally*** provided relative to the drivers. This is contrary to the present invention as herein claimed wherein the gradation voltages are generated ***internally*** of the source driver circuit portion of the device.

Accordingly, Applicants again respectfully submit that even though the source line driver circuit in both the reference and the present invention include a source driver and a grayscale ***reference*** voltage generation circuit(s), the Examiner semantic attempt to attribute the structure of the present invention to the allegedly corresponding structure of the prior art is technically in error. The Kamei et al reference makes it abundantly and unambiguously clear that elements 10 and 11 constitute the structures comparable to the structures referred to in the present specification as "source drivers". Therefore, it also is clear in the Kamei et al reference that the grayscale voltage generation circuit (i.e., the voltage dividing resistor circuit ***as opposed to the grayscale reference voltage generation circuits 4 and 5***) is not an internal part of either of the driver 10 or the driver 11.

Still further, in the Kamei, et al reference the source drivers 10 and 11 are specified to ***receive*** gradation voltages ***from*** the resistance-type voltage division circuit (gray scale voltage generation circuit) and to in turn output feed driving signals. This is directly contrary to the present invention wherein the ***source driver*** receives gray scale ***reference*** voltages and ***internally*** generates the gradation voltages.

In view of the foregoing, Applicants respectfully submit that the Examiner's present rejections are untenable. It is axiomatic that the construction given to the terms of the claims under examination must be consistent with the construction given to the structure disclosed the prior art. When this is done in this case, it is undeniably clear that the Kamei, et al reference structure is **not** the same as, and does not teach or suggest, the present invention (see also Background of the Invention section of the present application). Therefore, Applicants respectfully request reconsideration in response to this submission.

Similarly, the Examiner asserts that the Kamei reference renders the "resistance division ratios" discussed and claimed in the present specification obvious to a person of ordinary skill in the art. The Examiner's position in this respect is directly at odds with his assertion that the term "resistance division ratio" is so unclear in the present specification as to render the specification non-enabling to a person of ordinary skill in the art (35 USC 112, first paragraph) and/or so unclear as to render the specification unsatisfactory from the point of view of a person of ordinary skill in the art being adequately able to determine what the claims do and do not cover (35 USC 112, second paragraph).

Applicants upon careful consideration of the Examiner's comments concerning the phraseology including the term "voltage resistance division ratios" believe that they now have understood the Examiner's argument (i.e., voltage resistance division ratios must mean in the context of the specification either resistance division ratios or voltage division ratios). The foregoing Amendment specifically addresses the latter issue by deleting the term "voltage" (apparently introduced erroneously in the translation from the original Japanese) from the last quoted phrase. Applicants respectfully submit that the latter amendment removes the basis for the Examiner's rejection based upon the "voltage resistance" phraseology.

Nevertheless, Applicants again note that the Examiner apparently had little problem understanding what Applicants' claimed "resistance division ratios" were intended to mean in rejecting the pending claims. Analogously, Applicants respectfully submit that a person of ordinary skill in the art also would not have any problem in understanding the resistance division ratio terminology used in this application in the context of an admittedly well known resistance-type voltage division circuit. The present claim language and page 26, line 8 to page 27, line 21, of the present specification demonstrates this point conclusively. There are positive and negative sections of the resistance-type voltage division circuit and the voltage at any junction will depend upon the total resistance between the junction and the input as a fraction of the total resistance of the circuit section (see also page 20).

Thus, the Examiner has alleged that the following two passages found in the claims (i) are indefinite for failing to particularly point out and distinctly claim the present invention (i.e., to determine what is and what is not covered by the claims), and (ii) are insufficient to enable one skilled in the art to make and/or use the invention:

Passage 1:

> "positive-side (high level) voltage resistance division ratios and negative-side (low level) voltage resistance division ratios are set so as to be asymmetrical with one another depending upon level shift characteristics"

Passage 2:

> "resistance division ratios of the resistance-type voltage division circuit are set to conform to the target gray scale display characteristics associated with said target gray scale levels".

The Examiner's objection to passage 1 under 35 USC 112 has been addressed by the deletion of the word "voltage" thereby rendering it moot.

The Examiner's assertions that the second of the above passages is not clear and that it also does not enable one skilled in the art to make and/or use the invention, are based upon the Examiner's suggestion that the specification does not provide an express definition of the positive-side and negative-side resistance division ratios. The Examiner, however, still apparently refuses to take notice that the present specification clearly indicates that ***the various gray scale voltages generated by the source driver are to be set to conform to target gray scale display characteristics*** (i.e., characteristic relationships between an applied display signal input and the resulting display characteristics as well as the liquid crystal characteristics).

Thus, the inputs are predefined for any particular case (i.e., the positive-side highest level gray scale reference voltage, the negative-side lowest gray scale reference voltage, and whatever intermediate gray scale reference voltages that may be desired) as are the target output characteristics. No one of ordinary skill in the art would expect it to be possible to specify all of the various specific voltage inputs and/or specific resistor values and/or specific resultant gray scale output voltages that might work satisfactorily in a particular combination thereof.

Instead, the present invention contemplates that the **source driver** is to contain a ***well-known*** resistance-type voltage division circuit that receives at least one positive side reference voltage input and at least one negative side voltage level input and evidences positive-side voltage resistance division ratios and the negative-side voltage resistance division ratios at the respective resistor junctions that are **set respectively to correspond to a particular target gray scale characteristic** so that an appropriate gray scale voltage may be selected corresponding to input display data to the pixels being driven.

For example, it is known by those skilled in the art that liquid crystal voltages are determined by comparing characteristics of the liquid crystal material (V-T characteristic) and the γ characteristic to be adapted (input data intensity characteristic: D-T characteristic). Thus, with reference to the attached Figs. 1 and 2, in order to realize an intensity of gray-scale-32, liquid crystal applied voltage = 2.4V is calculated. Furthermore, source output voltage is determined by simulating or measuring the ΔV characteristic with gray scales.

As a particular example:

Applied voltage of gray-scale – 0 VLC0= 5V, at that time ΔV0 = a[V]
considering gray-scale – 0 as a reference, Ω 0 = 0
Applied voltage of gray-scale – 1 VLC1= 4.8V, at that time ΔV1 = b[V]
Ω 1 = b-a = 0.1V
Applied voltage of gray-scale – 2 VLC2= 4.5V, at that time ΔV2 = c[V]
Ω 2 = c-a = 0.15

.....

Applied voltage of gray-scale – 62 VLC62= 1.5V, at that time ΔV62 = d[V]
Ω 62 = d-a = 0.5V
Applied voltage of gray-scale – 63 VLC63= 1.2V, at that time ΔV63 = e[V]
Ω 63 = e-a = 0.55V

After determining the liquid crystal applied voltage, the output voltage value of source driver is determined.

In the case of dot reversal, if counter voltage is 5V,

Positive voltage of gray-scale-1 VH0= VCOM + VLC0 – 5 + 5 = 10V
In case of adding Ω0 VH0 = 10V
Positive voltage of gray-scale-1 VH0= VCOM + VLC0 – 5 + 5 = 10V
In case of adding Ω0 VH0 = 10V

Positive voltage of gray-scale-1 VH0= VCOM + VLC0 – 5 + 5 = 10V

In case of adding Ω0 VH0 = 10V

.....

Positive voltage of gray-scale-1 VH0= VCOM + VLC0 – 5 + 5 = 10V

In case of adding Ω0 VH0 = 10V

Positive voltage of gray-scale-1 VH0= VCOM + VLC0 – 5 + 5 = 10V

In case of adding Ω0 VH0 = 10V

Similarly, in the case of negative voltage,

Negative voltage of gray-scale-1 VL0= VCOM - VLC0 = 5 - 5 = 0V

In case of adding Ω0 VL0 = 0V

Negative voltage of gray-scale-1 VL1= VCOM + VLC1 = 5 – 4.8 = 0.2V

In case of adding Ω1 VL1 = 0.2 + 0.1 = 0.3V

Negative voltage of gray-scale-2 VL2= VCOM + VLC2 = 5 – 4.5 = 0.5V

In case of adding Ω2 VL2 = 0.5 + 0.15 = 0.65V

.....

Negative voltage of gray-scale-62 VL62 = VCOM + VLC62 = 5 – 1.5 = 3.5V

In case of adding Ω62 VL62 = 3.5 + 0.5 = 4.0V

Negative voltage of gray-scale-1 VL63= VCOM + VLC63 = 5 – 1.2 = 3.8V

In case of adding Ω63 VL63 = 3.8 + 0.55 = 4.35V

After determining the source output of each gray-scale in accordance with the above, serial resistance values inside the source driver are determined. The output will be asymmetrical to counter voltage Vcom because there is a ΔV characteristic like VH and VL as shown in the attached Fig. 3.

Then, according to the above-mentioned process, the output voltage fit to the liquid crystal characteristic and the serial resistance value corresponding to the output voltage are determined.

Consequently, the fact that the level shift ΔV is different for each gray scale level desired is reflected in the resistance division ratios of the resistance-type voltage division circuit set to generate the respectively desired gray scale voltage values at the respective intersections of the series connected resistors. Clearly, those skilled in the art are well aware of how to manipulate the values of the various resistors in the resistor-type voltage division circuit so as to achieve desired voltage outputs at each resistor intersection along series connected resistors when at least the positive-side highest-level and the negative-side lowest-level gray scale voltages and the desired number and output qualities of the intermediate gray scale voltages are known.

Thus, in the examples discussed in the specification, the resistance ratios and the positive-side voltage resistance ratio at a particular selected one of the resistance junctions or a negative-side voltage resistance ratio at a particular selected one of the resistance junctions of the voltage division circuit **within the source driver (as defined separately from the source line driver)** are set to determine a gray scale voltage output corresponding to a particular one of the levels of a 64-level gray scale display that may be selected by the source driver according to the input data signal. The actual voltage and resistance values will vary depending upon the particular situation. It is to be understood, however, that both the positive-side resistance division ratio and the negative-side voltage resistance division ratio at the respective resistance junctions in the resistance-type voltage division circuit are readily determinable and/or variable by those skilled in the art in each particular situation to achieve the desired voltage output at each intersection. Applicants respectfully submit that this is particularly the case due to the assumed knowledge of the prior art (particularly that recited in the background portion of the present specification) by individuals of ordinary skill in the art along with the teachings of the present specification.

Applicants further again respectfully submit that no rule or holding requires that the terms and/or phraseology used in the claims must be defined ***per se*** in the specification. What is required is that the specification must be such as to indicate that the Applicants were in possession of the invention at the time that they applied for patent protection and that the specification must be sufficient to enable a person of ordinary skill in the art to practice the invention without undue experimentation and also to be able to determine when his activity falls within the terms of the claims and when it does not. Further, the features of the claims must be shown in the drawings just as they must be fully discussed in the specification.

In this case, the specification (particularly at page 25, line 2 to page 27, line 6) could not be more clear and definite to a person of ordinary skill in the art. At that point in the specification, it is noted that the gray scale voltage generation circuit 11 of the source driver 2 is a resistance-type voltage division circuit the components and operation of which the specification describes in detail. Specifically, at page 26, lines 15-18, it is stated that: "The positive-side second gray scale voltage V_{H2} generates at the intersection of resistors R_{H1} and R_{H2} ***depending on the resistance division ratio of the resistance-type voltage division circuit***." (Emphasis added) This sentence is followed by statements that clearly indicate that all of the voltages generated by the resistance-type voltage generation circuit are generated in the same way.

Still further, Figure 4 (which is a graph showing positive-side gray scale voltage vs. resistance and negative-side gray scale voltage vs. resistance) by definition shows the positive-side voltage resistance division ratios and the negative-side voltage resistance division ratios for an exemplary case. It also clearly shows that the relationship of the positive-side voltage resistance ratios to the negative-side voltage resistance ratios is asymmetrical when the shift level characteristic is corrected as specifically described in the paragraph bridging pages 27 and 28 of the present specification.

In this regard, the Examiner's attention is respectfully directed to the last sentence of the paragraph just mentioned that states: "As shown in FIG. 4, the resistance values of the series resistors for generating the positive-side gray scale voltages are set vertically asymmetrical with the resistance values of the series resistors for generating the negative-side gray scale voltages in consideration of the correction of the level shift ΔV characteristic." This ties directly with the first full paragraph of page 31 of the present specification that reads as follows:

> "In the present embodiment, in consideration of the level shift ΔV on the gray scale voltage, the positive-side voltage resistance division ratios and the negative-side voltage resistance division ratios of the resistance-type voltage division circuit **inside the source driver** are set so as to be asymmetrical with one another. Therefore, voltages can be output in accordance with the level shift ΔV characteristic as indicated by the curves 21 and 22 shown in FIGS. 5 and 6. Furthermore, by the above-mentioned setting of the resistance division ratios, the source line drive circuit having the source driver in accordance with the present embodiment can generate gray scale voltages, **the center values of which have the characteristic indicated by the curve 32 of FIG. 13**. Therefore, the deviation of the correction of the level shift ΔV characteristic does not occur, thereby completely solving the display problem of flicker and the like." (Emphasis added)

Applicants consequently respectfully submit that the conclusion is inescapable that to the extent that voltage resistance division ratios are referred to correctly in the present specification, they are representatively depicted in FIG. 4, and that no one skilled in the art could conclude otherwise.

Again, the lack of specific values or some sort of an equation defining these variables is not a justifiable basis for the Examiner's objection to the drawings and/or the specification as not showing the invention being claimed. Similarly, the optimum configuration (previously amended to adopt the perhaps less ambiguous "target gray scale" criteria) clearly is shown in numerous of the drawings, see for example, Figs. 3-6 and 12-13.

Accordingly, Applicants respectfully submit that they have disclosed and shown the elements of the present invention in the specification and drawings of this application in a clear, definite and appropriate manner. Applicants are entitled to assume that the person of ordinary skill in the art given the known gray scale levels desired in any particular context and the peculiarities of the display device involved will have little difficulty in setting the resistance values of the well known resistance-type voltage division circuit correctly, and otherwise will clearly understand and be able to make and/or use the invention in light of the specification and drawings currently on file. (Note again that should there be any question at all as to what the positive-side voltage resistance division ratio or the negative-side voltage resistance division ration is, that question is fully answered in FIG. 4 and at pages 25-27 of the present specification.)

In addition, as previously mentioned, there is generally an inverse relationship between the level of skill and knowledge in the art and the degree of specificity of disclosure required of the applicant. Therefore, assuming that the meaning of the claim terminology is clear to those skilled in the art in view of the specification and their knowledge, the specification need not exhaustively define each term used nor meticulously describe each feature of the invention. (see, *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F2d 1367, 1379-1380, 231 USPQ 81, 90 (Fed. Cir. 1986)

Accordingly, Applicants already have made of record in this prosecution and discussed above the facts that in the Kamei, et al type resistance-type voltage division circuit is well known in the art, and that it is ***external of*** the source driver rather than being an ***internal*** part thereof. Further, Applicants also have made of record the facts that the resistance-type voltage division circuit of the Kamei reference becomes more and more impractical as the number of gray scale levels in the target gray scale characteristic increases. The reasons for this include size considerations, production cost, power consumption and resistor accuracy achievable with standard components.

In addition, even if resistor accuracy itself was not a severe problem, the formation of the Kamei, et al type circuit ***outside*** of the "source driver" suffers from increasing instability as the number of gray scale levels in the target gray scale characteristic increases. This is because of external factors such as noise from surrounding components that disrupts the small voltage gradations between the gray scale level voltages being generated for use in the output display.

The problems of the Kamei type circuit are avoided in the present invention, however, because the resistance-type voltage division circuitry located ***internally*** of the source driver is uniquely established so as to divide input reference voltages asymmetrically without the need to provide large scale voltage division components external to the source driver including the capability of providing alternating reference voltages to the mid-point of the division circuit. Instead, the present invention accomplishes all of the theoretical benefits of a Kamei et al type circuit ***internally*** of the source driver in a less complex, cheaper and smaller manner.

The Nitta, et al reference does not alter the foregoing even if the Examiner is correct in his derivation of resistance ratios from voltage ratios in the context of the Kamei et al circuit in view of the Nitta, et al disclosure. The prior art teaches either that the source driver may contain a resistance-type voltage division capability wherein all of the resistors are equal to one another and such asymmetry as is present arises from asymmetry in the reference voltages provided to the internal resistance-type voltage division circuit; or a Kamei et al type circuit wherein an ***external*** resistance-type voltage division circuit is provided that supplies the desired gray scale voltages for each of the target gray scale levels to the source driver. The former of these alternatives is inaccurate and the latter is impractical for gray scale characteristics having a large number of gray scale levels. Hence, the present invention, wherein the internal resistance-type voltage division circuitry is capable of providing all of the required gray scale voltage levels for the target gray scale characteristic with either no, or at least a smaller than otherwise, gray scale reference voltage generator represents a significant, unique and novel advance in the art.

Consequently, for each and all of the foregoing reasons and in light of the foregoing clarifying amendments, it is respectfully submitted (i) that the Examiner's analysis of the cited art is in error as he has applied it to the present claims, (ii) that upon reconsideration the Examiner will agree that his present rejections should be withdrawn for the reasons herein stated, and (iii) that the claims of this application as they will stand upon the entry of the foregoing Amendment are in condition for allowance. Reconsideration of this application and the allowance of Claims 1-11 of this application in response to this communication, therefore, are respectfully requested.

Finally, Applicants believe that additional fees are not required in connection with the consideration of this response to the currently outstanding Official Action. However, if for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge and/or credit Deposit Account No. **04-1105**, as necessary, for the correct payment of all fees which may be due in connection with the filing and consideration of this communication.

Respectfully submitted,

Date: June 9, 2004

By: David A. Tucker
David A. Tucker
Reg. No. 27,840
Attorney for Applicant(s)

EDWARDS & ANGELL, LLP
P.O. Box 9169
101 Federal Street
Boston, MA 02109
(617) 523-3400
446388